

**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**DRUM TYPE WASHING MACHINE HAVING VIBRATION**

**ATTENUATING MEANS**

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075318 filed on November 29, 2002 which is/are hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

[0002] The present invention relates to a washing machine, and more particularly, to a drum type washing machine having a vibration attenuating means, by which vibrations generated from driving the drum type washing machine are attenuated.

### Discussion of the Related Art

[0003] Generally, a washing machine holds water and detergent in a lower part of a tub. After laundry is put in a drum installed inside the tub, the drum is rotated to perform washing, rinsing, and dewatering.

[0004] Such a washing machine is an apparatus for eliminating dirt or filth attached to the laundry by applying a mechanical force thereto together with a detergent.

[0005] Specifically, a drum type washing machine is an apparatus for eliminating dirt or filth attached to the laundry by putting the laundry, water, and detergent in a drum horizontally installed to rotate by a driving force of a motor. The drum type washing machine barely has entanglement and damage of the laundry, consumes less water, and even has washing effects of beating and rubbing.

[0006] FIG. 1 is a schematic perspective view of a drum type washing machine according to a related art, in which an internal view is shown in part. And, FIG. 2 is a cross-sectional view of a drum type washing machine according to a related art.

[0007] Referring to FIG. 1 and FIG. 2, a drum type washing machine according to a related art consists of a cabinet 10 forming an exterior, a tub 20 provided in the cabinet to

hold laundry, water, and detergent therein, a motor 30 in rear of the tub 20 to have a horizontally installed rotational shaft, a drum 40 provided in the tub 20 to hold the laundry, a damper 50 installed at right and left lower sides of the tub 20 to attenuate vertical and horizontal vibrations of the tub 20, and an elastic means 60 installed at right and left upper sides of the tub 20 to attenuate the vertical and horizontal vibrations of the tub 20.

[0008] The cabinet 10 consists of a top plate 11 provided on a topside, a base plate 12 provided on a bottom side, and a cabinet cover 13 provided on a front side to have an entrance (not shown in the drawing) at a central portion to put in/out the laundry.

[0009] A door 13 is installed at the cabinet cover 13 to prevent the laundry from popping out through the entrance. And, a gasket 21 is installed between the door 13a and the tub 20 to alleviate a shock caused by a rotation of the drum 40 and to play a role as a packing in preventing water leakage.

[0010] A control panel 11a for controlling an operation of the drum type washing machine is installed on the top plate 11. And, a plurality of lifters 41 are installed on an inside of the drum 40 to pull up the laundry to a predetermined height to fall by gravity.

[0011] Meanwhile, a water supply hose 16, a water supply valve (not shown in the drawing), and a detergent box 17 are installed in an upper part of the cabinet 10 to supply the water and detergent to the tub 20. And, a drain pump 18 and a drain hose 19 are installed at one side under the tub 20 to circulate or discharge the water.

[0012] The damper 50 consists of a left damper 51 having one end connected to the left lower side of the tub 20 and the other end connected to a top of the base plate 12 and a right damper 52 having one end connected to the right lower side of the tub 20 and the other end connected to the top of the base plate 12.

[0013] And, the elastic means 60 consists of a left spring 61 having one end

connected to a left upper lateral side of the cabinet 10 and the other end connected to a left upper side of the tub 20 and a right spring 62 having one end connected to a right upper lateral side of the cabinet 10 and the other end connected to a right upper side of the tub 20.

[0014] However, the above-constructed drum type washing machine according to the related art attenuates the vertical and horizontal vibrations using the damper 50 and elastic means 60 but fails to attenuate a front-to-rear vibration, whereby the tub severely shakes in front-to-rear directions. Specifically, the front-to-rear vibration recently raises a big problem in a large-capacity high-speed drum type washing machine.

[0015] And, the front-to-rear vibration of the tub 20 makes shocks appearing on parts such as the damper 50 and the gasket 21 to degrade their endurances. Moreover, the front-to-rear vibration as affects operations of the drum 40 inside the tub 20 and the motor 30 in rear of the tub 20 so that the drum type washing machine is unstably driven during washing, rinsing, and dewatering.

[0016] To overcome such a problem, a new drum type washing machine enabling to attenuate the front-to-rear vibration is needed.

#### SUMMARY OF THE INVENTION

[0017] Accordingly, the present invention is directed to a drum type washing machine having a vibration attenuating means that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0018] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a drum type washing machine having a vibration attenuating means, which enables to attenuate vertical, horizontal, and front-to-rear vibrations.

[0019] Additional features and advantages of the invention will be set forth in the

description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the  
5 appended drawings.

[0020] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a drum type washing machine including a cabinet forming an exterior, a tub provided in the cabinet to have a front opening and to hold water, and detergent therein, a motor in rear of the tub 200 to have a  
10 horizontally installed rotational shaft, a drum in the tub to be rotated by the motor, and a vibration attenuating means that includes a damper unit under the tub to attenuate vertical and horizontal vibrations of the tub and an elastic member over the tub to attenuate a front-to-rear vibration of the tub.

[0021] The damper unit is installed at right and left sides under the tub, and more  
15 preferably, at a middle portion between front and rear sides under the tub.

[0022] The elastic member is installed at front and rear sides over the tub, and more preferably, at a middle portion between right and left sides over the tub.

[0023] The cabinet includes a base plate installed as a bottom of the cabinet, a pair of side plates on both sides of the base plate, a rear plate in rear of the base plate and the side  
20 plates, a front plate in front of the base plate and the side plates, and a top plate on the side, rear, and front plates.

[0024] In the above-constituted drum type washing machine, the elastic member includes a front spring having one end connected to an upper front side of the tub to extend in an upper front direction and the other end connected to a lower front side of the top plate and

a rear spring having one end connected to an upper rear of the tub to extend in an upper rear direction and the other end connected to a lower rear side of the top plate.

[0025] The elastic member may include a front spring having one end connected to an upper front side of the tub to extend in an upper front direction and the other end connected to a lower front side of the top plate and a rear spring having one end connected to an upper rear of the tub to extend in an upper rear direction and the other end connected to an upper side of the rear plate.

[0026] And, the elastic member may include a front spring having one end connected to an upper front side of the tub to extend in an upper front direction and the other end connected to an upper side of the front plate and a rear spring having one end connected to an upper rear of the tub to extend in an upper rear direction and the other end connected to a lower rear side of the top plate.

[0027] Moreover, the elastic member may include a front spring having one end connected to an upper front side of the tub to extend in an upper front direction and the other end connected to an upper side of the front plate and a rear spring having one end connected to an upper rear of the tub to extend in an upper rear direction and the other end connected to an upper side of the rear plate.

[0028] Besides, the tub includes a connecting member at the upper front and rear sides to have the elastic member connected thereto.

[0029] Therefore, the above-constructed drum type washing machine attenuates the vertical, horizontal, and front-to-rear vibrations and reduces noise generated from driving the washing machine.

[0030] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to

provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The accompanying drawings, which are included to provide a further  
5 understanding of the invention and are incorporated in and constitute a part of this application,  
illustrate embodiment(s) of the invention and together with the description serve to explain  
the principle of the invention. In the drawings:

[0032] FIG. 1 is a schematic perspective view of a drum type washing machine  
according to a related art, in which an internal view is shown in part;

10 [0033] FIG. 2 is a cross-sectional view of a drum type washing machine according to  
a related art;

[0034] FIG. 3 is a schematic perspective view of a drum type washing machine  
according to the present invention, in which an internal view is shown in part;

[0035] FIG. 4 is a cross-sectional view of a drum type washing machine according to  
15 a first embodiment of the present invention;

[0036] FIG. 5 is a cross-sectional view of a drum type washing machine according to  
a second embodiment of the present invention;

[0037] FIG. 6 is a cross-sectional view of a drum type washing machine according to  
a third embodiment of the present invention; and

20 [0038] FIG. 7 is a cross-sectional view of a drum type washing machine according to  
a first embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0039] Reference will now be made in detail to the preferred embodiment(s) of the

present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0040] FIG. 3 is a schematic perspective view of a drum type washing machine according to the present invention, in which an internal view is shown in part.

[0041] Referring to FIG. 3, a drum type washing machine according to the present invention includes a cabinet 100, a tub 200 provided in the cabinet to hold laundry, water, and detergent therein, a motor 300 in rear of the tub 200 to have a horizontally installed rotational shaft, a drum 400 provided in the tub 200, and a damper 500 attenuating vibrations of the tub 200.

[0042] FIG. 4 is a cross-sectional view of a drum type washing machine according to a first embodiment of the present invention, FIG. 5 is a cross-sectional view of a drum type washing machine according to a second embodiment of the present invention, FIG. 6 is a cross-sectional view of a drum type washing machine according to a third embodiment of the present invention, and FIG. 7 is a cross-sectional view of a drum type washing machine according to a first embodiment of the present invention.

[0043] Referring to FIG. 4, a drum type washing machine according to a first embodiment of the present invention includes a cabinet 100 forming an exterior, a tub 200 provided in the cabinet to hold laundry, water, and detergent therein, a motor 300 in rear of the tub 200 to have a rotational shaft horizontally penetrating into the tub 200, a drum 400 provided in the tub 200 to be connected to the rotational shaft of the motor 300 to hold the laundry, and a vibration attenuating means for attenuating vibrations generated from the tub 200 when the drum 400 is driven to rotate by a driving force of the motor 300.

[0044] The cabinet 100 includes a base plate 120 installed as a bottom, a pair of side



plates 120 provided on both sides of the base plate 120, a rear plate 150 provided in rear of the base plate 120 and the side plates 140, a front plate 130 provided in front of the base plate 120 and the side plates 140, and a top plate 110 provided on the side, rear, and front plates.

[0045] In this case, the front plate 130 includes an entrance at a center through which the laundry is put in/out and a door 131 opening/closing the entrance to prevent the laundry from being thrown away through the entrance.

[0046] A gasket 210 is installed between the door 131 and the tub 200 to alleviate a shock generated from the tub 200 and to play a role of a packing for preventing water from leaking outside.

[0047] A control panel 111 controlling an operation of the drum type washing machine is installed on a the top plate 110.

[0048] And, a plurality of lifters 410 are installed on an inside of the drum 400 to pull up the laundry to a predetermined height to fall by gravity.

[0049] Moreover, a water supply hose 160, a water supply valve (not shown in the drawing), and a detergent box 170 are installed in an upper part of the cabinet 100 to supply the water and detergent to the tub 200. And, a drain pump 180 and a drain hose 190 are installed at one side under the tub 200 to circulate or discharge the water.

[0050] The vibration attenuating means includes a damper unit 500 installed left and right sides beneath the tub 200 to attenuate vertical and horizontal vibrations of the tub 200 and an elastic member 600 installed onto front and rear sides of the tub 200 to attenuate a front-to-rear vibration of the tub 200.

[0051] The damper unit includes a left damper 510 having one end connected to a left bottom side of the tub 200 to extend in a left lower direction and the other end connected to an upper left side of the base plate 120 and a right damper 520 having one end connected to a

right bottom side of the tub 200 to extend in a lower right direction and the other end connected to a right upper side of the base plate 120.

[0052] In this case, both ends of each of the dampers 510 and 520 are hinge-coupled with the tub 200 and the base plate 120, respectively to support the tub 200.

5 [0053] The elastic member 600 includes a front spring 611 having one end connected to an upper front side of the tub 200 to extend in an upper front direction and the other end connected to a lower front side of the top plate 110 and a rear spring 612 having one end connected to an upper rear of the tub 200 to extend in an upper rear direction and the other end connected to a lower rear side of the top plate 110.

10 [0054] Spring connecting members 220 and 230 are provided at the upper front and rear sides of the tub 200, to which the one ends of the front and rear springs 611 and 612 are connected, to be connected to the one ends of the front and rear springs 611 and 612, respectively.

[0055] Openings are formed at the spring connecting members 220 and 230 to have  
15 the one ends of the springs 611 and 612 fitted thereto for coupling.

[0056] And, spring fixing members 240 and 250 are provided at the lower front and rear sides, to which the other ends of the front and rear springs 611 and 612 are connected, to have the other ends of the front and rear springs 611 and 612 fixed thereto.

[0057] An operation of the above-constructed drum type washing machine according  
20 to the present invention is explained as follows.

[0058] First of all, once a power is applied to the drum type washing machine, water is supplied to the tub 200 according to an amount of the laundry put in the drum 400 via the water supply hose 160.

[0059] After the tub 200 is sufficiently filled with the supplied water, a washing step

is executed so that the drum 400 is rotated by the driven motor 300.

[0060] Once the drum rotates, the laundry in the drum 400 is lifted up to fall down to remove the dirt or filth attached to the laundry.

[0061] After completion of the washing step, a draining step is initiated to discharge the used water in the tub 200 outside the cabinet using the drain pump and hose 180 and 190.

[0062] In rear half of the draining step, a dewatering step is executed by having the drum 400 rotate at high speed to remove water contents involved in the laundry.

[0063] After completion of the draining step, new water is supplied to the tub 200 and the drum 400 is then rotated to perform a rinsing step for rinsing the laundry.

[0064] Thus, in the washing, rinsing, and dewatering steps, the drum 400 is rotated by the motor to generate vibrations to vibrate the tub 200 outside the drum 400.

[0065] In such a case, the horizontal and vertical vibrations of the tub 200 are alleviated by the damper unit 500 and the front-to-rear vibration of the tub 200 is alleviated by the elastic member 600, whereby the overall vibrations of the washing machine are attenuated.

[0066] The elastic member enables to attenuate the vertical vibration together with the damper unit as well as the front-to-rear vibration of the tub.

[0067] Meanwhile, the installation structure of the elastic means 600 can be variously modified according to the positions to which the front and rear springs 611 and 621 are fixed.

[0068] Such modifications are explained in the description of second to fourth embodiments of the present invention as follows.

[0069] In the description of second to fourth embodiments of the present invention, overall elements of the present invention except the elastic member are the same of the first embodiment of the present invention, thereby being skipped in the following.

[0070] Referring to FIG. 5, the elastic member 600 according to a second

embodiment of the present invention includes a front spring 612 having one end connected to an upper front side of the tub 200 to extend in an upper front direction and the other end connected to a lower front side of the top plate 110 and a rear spring 622 having one end connected to an upper rear of the tub 200 to extend in an upper rear direction and the other end connected to an upper side of the rear plate 150.

[0071] And, spring fixing members 241 and 251, to which the other ends of the front and rear springs 612 and 622 are connected, are provided at the lower front side of the top plate 110 and the upper side of the rear plate 150, respectively.

[0072] Referring to FIG. 6, the elastic member 600 according to a third embodiment of the present invention includes a front spring 613 having one end connected to an upper front side of the tub 200 to extend in an upper front direction and the other end connected to an upper side of the front plate 130 and a rear spring 623 having one end connected to an upper rear of the tub 200 to extend in an upper rear direction and the other end connected to a lower rear side of the top plate 110.

[0073] And, spring fixing members 242 and 252, to which the other ends of the front and rear springs 613 and 623 are connected, are provided at the upper side of the front plate 130 and the lower rear side of the top plate 110, respectively.

[0074] Referring to FIG. 7, the elastic member 600 according to a fourth embodiment of the present invention includes a front spring 614 having one end connected to an upper front side of the tub 200 to extend in an upper front direction and the other end connected to an upper side of the front plate 130 and a rear spring 624 having one end connected to an upper rear of the tub 200 to extend in an upper rear direction and the other end connected to an upper side of the rear plate 150.

[0075] And, spring fixing members 243 and 253, to which the other ends of the front

and rear springs 614 and 624 are connected, are provided at the upper side of the front plate 130 and the upper side of the rear plate 150, respectively.

[0076] Accordingly, the drum type washing machine according to the present invention has the following effects or advantages.

5 [0077] First of all, the damper unit including the left and right dampers attenuate the vertical and horizontal vibrations of the tub and the elastic member including the front and rear springs attenuates the front-to-rear vibration as well as the vertical vibration of the tub, whereby the overall vibrations and noise are remarkably reduced.

10 [0078] Secondly, the present invention remarkably reduces the front-to-rear vibration of the tub to prevent the internal parts near the tub from being damaged by shocks according to the vibrations, whereby endurances of the internal parts are preserved.

15 [0079] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.